

What is claimed is:

1. An apparatus for controlling a joint force of a friction-joint component placed in a torque transmitting mechanism mounted on a vehicle, the friction-joint component receives, as an input torque, a torque generated by a drive source to output the inputted torque, as an outputted torque, from the torque transmitting mechanism, comprising:

a guideline producing unit configured to produce a first target operation guideline directed to the torque transmitting mechanism and a second target operation guideline directed to the drive source, the first target operation guideline including information regulating a transmitted torque capacity of the torque transmitting mechanism;

a joint force controlling unit configured to control the joint force of the friction-joint component based on the first target operation guideline, the joint force controlling unit including a joint force setting unit configured to set a value to the joint force depending on the information regulating the transmitted torque capacity; and

a drive force controlling unit configured to control a drive force of the drive source based on the second target operation guideline, the drive force leading to the torque inputted to the friction-joint component.

2. The apparatus according to claim 1, wherein the information regulating the transmitted torque capacity is a transmitted-torque capacity lower limit of the torque transmitting mechanism, wherein

the joint force setting unit is configured to set the value to the joint force so that the transmitted torque capacity is equal to or larger than the transmitted-torque capacity lower limit.

3. The apparatus according to claim 1, further comprising a calculating unit configured to calculate a maximum value of the transmitted torque capacity settable by the torque transmitting

mechanism,

wherein the guideline producing unit is configured to produce the first target operation guideline including the information regulating the transmitted torque capacity of the torque transmitting mechanism so that the transmitted-torque capacity is equal to or less than the maximum value.

4. The apparatus according to claim 1, further comprising a calculating unit configured to estimate or detect an actually transmitted torque capacity set to the torque transmitting mechanism,

wherein the guideline producing unit is configured to produce the second target operation guideline on the basis of the actually transmitted torque capacity.

5. The apparatus according to claim 4, wherein the guideline producing unit is configured to produce the second target operation guideline so that the inputted torque to the torque transmitting mechanism is equal to or less than the actually transmitted torque capacity.

6. The apparatus according to claim 1, further comprising a calculating unit configured to estimate a maximum torque to be applied to the torque transmitting mechanism through the inputted torque,

wherein the guideline producing unit is configured to produce the first target operation guideline indicative of the transmitted torque capacity larger than the maximum torque applied to the torque transmitting mechanism.

7. The apparatus according to claim 6, further comprising a unit configured to determine whether or not there is an idling of a drive shaft coupled to the friction-joint component,

wherein the maximum torque calculating unit is configured,

when there is the idling of the drive shaft, to raise the maximum torque than a maximum obtained when there is no idling of the drive shaft.

8. The apparatus according to claim 7, wherein the maximum
5 torque calculating unit is configured, when there is the idling of the drive shaft, to raise the maximum torque as an amount of idling increases.

9. The apparatus according to claim 2, wherein the guideline
10 producing unit has a unit configured to produce the transmitted torque capacity given to the torque transmitting mechanism in accordance with a torque applied via the inputted torque to the torque transmitting mechanism and an operated condition of the torque transmitting mechanism and a unit configured to finally designate, as the
15 transmitted torque capacity, either one which is larger than the other between the transmitted torque capacity given to the torque transmitting mechanism and the transmitted-torque capacity lower limit.

20 10. The apparatus according to claim 9, further comprising a unit configured to estimate a joint condition of the friction-joint component,

wherein the transmitted-torque capacity producing unit is configured, when the estimation unit estimates that the joint condition
25 of the friction-joint component is improper, to raise the transmitted torque capacity given to the torque transmitting mechanism.

11. The apparatus according to claim 10, wherein the estimation unit is configured to determine that the joint condition of the
30 friction-joint component is improper in cases where a difference between a rotation speed attributable to the inputted torque from the drive source to the friction-joint component and a further rotation speed

attributable to the output torque from the friction-joint component to the drive shaft is hither than a predetermined value.

12. The apparatus according to claim 9, further comprising a
5 unit configured to estimate an operating temperature of the torque transmitting mechanism

wherein the transmitted-torque capacity producing unit is configured, when the estimation unit estimates that the operating temperature is outside a predetermined temperature range that gives a
10 proper operating condition to the torque transmitting mechanism, to raise the transmitted torque capacity given to the torque transmitting mechanism.

13. The apparatus according to claim 9, further comprising a
15 unit configured to detect a malfunction of the torque transmitting mechanism

wherein the transmitted-torque capacity producing unit is configured, when the detection unit detects the malfunction of the torque transmitting mechanism, to change the first target operation
20 guideline so that the transmitted torque capacity given to the torque transmitting mechanism is raised.

14. The apparatus according to claim 13, wherein the guideline producing unit includes a unit configured, in cases where the detection
25 unit detects the malfunction of the torque transmitting mechanism, to designate the maximum value of the transmitted torque capacity as the transmitted-torque capacity lower limit.

15. The apparatus according to claim 13, wherein the guideline
30 producing unit includes a unit configured to first determine either one which is larger than the other between the transmitted-torque capacity lower limit for correcting inertia of the drive shaft and a target engine

torque for running, to second determine either one which is smaller than the other between a value determined by the first determination and the maximum value of the transmitted torque capacity, and to designate a value determined by the second determination as the
5 transmitted-torque capacity lower limit.

16. The apparatus according to claim 1, wherein the second target operation guideline includes information indicative of a target value of engine torque, the information being given to the drive force
10 controlling unit.

17. The apparatus according to claim 1, wherein the drive force controlling unit has a unit configured to calculate a maximum drive torque and a minimum drive torque which are currently available by the
15 drive source that is under control of the drive force controlling unit and to give a calculated result to the guideline producing unit and

the guideline producing unit has a unit configured to set the guidelines on the basis of the calculated result.

20 18. The apparatus according to claim 1, wherein the torque transmitting mechanism is a continuously variable transmission arranged in the drive shaft.

19. The apparatus according to claim 1, wherein the torque
25 transmitting mechanism is a connected/disconnected type of transmission arranged in the drive shaft.

20. A method of controlling a joint force of a friction-joint component placed in a torque transmitting mechanism mounted on a
30 vehicle, the friction-joint component receives, as an input torque, a torque generated by a drive source to output the inputted torque, as an outputted torque, from the torque transmitting mechanism, the method

comprising the steps of:

producing a first target operation guideline directed to the torque transmitting mechanism and a second target operation guideline directed to the drive source, the first target operation guideline including information regulating a transmitted torque capacity of the torque transmitting mechanism; and

controlling the joint force of the friction-joint component based on the first target operation guideline, the joint force controlling including setting a value to the joint force depending on the information regulating the transmitted torque capacity and controlling a drive force of the drive source based on the second target operation guideline, the drive force leading to the torque inputted to the friction-joint component.